

**REQUEST FOR RESEARCH PROPOSALS**  
(October 2002 - September 2003 Funding Cycle)

For the

**ROCKY MOUNTAIN REGIONAL  
HAZARDOUS SUBSTANCE RESEARCH CENTER  
(U. S. EPA REGION 8)**

Colorado State University, Fort Collins, Colorado  
Colorado School of Mines, Golden, Colorado

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**Release Date: April 9, 2002**  
**Proposal Due Date: June 10, 2002**

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**General Background**

The Hazardous Substance Research Center (HSRC) program supports five multi-university regional centers nationwide. Each HSRC focuses on a different aspect of hazardous substance management and conducts an active program of basic and applied research, technology transfer, and training. These five HSRCs bring together researchers from a variety of disciplines to collaborate on integrated research projects that involve practical problems of hazardous substance management as well as long-term, exploratory research. Basic funding for the HSRC program comes from the U. S. Environmental Protection Agency (EPA), with additional funding from the Department of Energy, and the Department of Defense, academia, industry, and other state and federal government agencies. Further information on the HSRC program can be found at: [www.hsrg.org](http://www.hsrg.org).

The Rocky Mountain Regional HSRC was officially formed on November 1, 2001, as part of EPA's HSRC program. The focus of the Rocky Mountain Regional HSRC is on the remediation of pollution and other problems from present and former mining activities. The research component of the Rocky Mountain Regional HSRC consists of a consortium of participants from Colorado State University, Colorado School of Mines, and several academic and non-academic participants from other regions of the U.S. and Canada. The research goal of the Rocky Mountain Regional HSRC is to develop new and to improve existing methods or technologies that are cost-effective for remediation of mine-waste sites and lead to clean-ups that are protective of human health and the environment. Although the Rocky Mountain Regional HSRC officially represents EPA Region 8 states (Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming), the activities of the Rocky Mountain Regional HSRC also pertain to any location within the U. S., particularly where remediation of mine waste is required and/or where there is contamination by metals. Additional information on the Rocky Mountain Regional HSRC can be found at: [www.engr.colostate.edu/hsrg/](http://www.engr.colostate.edu/hsrg/).

## **Description of Research Focus Areas for the Rocky Mountain Regional HSRC**

The research program for the Rocky Mountain Regional HSRC is separated into five research focus areas: (1) site characterization and contaminant transport/transformation, (2) surface water and sediment transport, (3) treatment processes, (4) technologies, and (5) ecological and human toxicity and health. A brief overview of each of these research focus areas is provided below; additional information on the research focus of the Rocky Mountain Regional HSRC can be found at: [www.engr.colostate.edu/hsrc/](http://www.engr.colostate.edu/hsrc/).

1. Site characterization refers to efforts to identify problem contaminants, locate source(s) of release, delineate zone(s) of contamination and impacted areas, and define the receptors (neighbors, drinking water supplies, etc.). The focus of the research activities of the Center in this regard is on the development of more rapid and cost-effective methods to accurately characterize the transport and fate of metals and other chemicals from mining sites.

In the transport and transformation area, the Center focuses on research dedicated to improving our understanding of the roles of chemical and physical transformations in controlling the mobility of contaminants. An additional goal is to understand the bioavailability of the metals and, ultimately, their effects on human health and the environment.

In addition, flow and transport, particularly in the unsaturated domain (in some cases, including oxygen depletion characteristics), play critical roles in the reclamation of a wide variety of mine-related waste sources. Understanding flow and transport is essential, for example, for the evaluation of leaching of acid, cyanide, and/or metals from spent heap-leach pads, fluvial tailings deposits, and tailings impoundments. This type of understanding is also essential for the design of soil cover systems for minimization of infiltration. Field hydrological studies performed to validate models used to predict impacts from spent heap-leach pads or other waste deposits are sparse. Therefore, a more integrated modeling approach is required for the design of final covers for mine waste reclamation. We need models that offer the ease of use of the EPA-developed HELP model, plus the accuracy similar to that provided by more robust unsaturated flow models. Thus, the research activities of the Center focus on the development and validation of models used to improve our ability to predict impacts resulting from mine wastes.

2. Research in the Surface Water and Sediment Transport Focus Group of the Center focuses on limiting impacts from metals, acidity, and any other parameters of concern. The aim of this research focus is to develop watershed-specific water quality management plans for the purposes of implementing waste-load allocations for point-sources typical of mine-waste related Superfund sites.

3. The Treatment Processes Focus Group of the Center conducts research on both abiotic and biologically mediated processes that can be used to treat mine waste streams, including acid mine drainage. Examples of these processes include, but are not limited to, filtration and sedimentation, oxidation/reduction, biological alkalinity production, plant uptake (phytoremediation), and metals precipitation as hydroxides and sulfides. Research emphasis on the treatment processes is placed on cost-effective treatment of metal mixtures versus single metal waste streams because most

environmental impacts resulting from mining activities involve contamination resulting from several metals.

4. The Technologies Focus Group is involved in two broad research categories: (1) treatment technologies, and (2) prevention and control technologies. Regarding treatment technologies, Center research emphasizes passive treatment systems that clean the contaminated medium (e.g., ground water) without continual inputs of materials and energy, such as natural and constructed wetlands and permeable reactive barriers. The prevention and control technology category refers to processes that are used to prevent and/or control the generation of leachate that contains metals and other chemicals, such as acid mine drainage (e.g., stabilization and solidification, blending and layering, and alternative covers).

5. The Ecological and Human Toxicology Focus Group performs research that specifically targets assessments of the impacts of mine wastes on human health and the environment. This focus group addresses chemical contamination problems by assessing possible adverse effects of mine-waste contamination on humans and ecosystems. For example, assessment of impacts on biotic receptors is often complicated by the difficulty of distinguishing the role of habitat characteristics from the adverse effects of contaminants. Thus, one specific area of need is a better understanding of the use of molecular and biochemical indicators as a way of detecting specific contaminant/receptor (fish, plants, humans, etc.) relationships. This represents a much more cost-effective process for estimating risk. An additional focus of this group is the use of more conventional toxicological methods to screen the relevance and effectiveness of ideas and technologies generated by the Center's research.

### **Specific Research Needs**

Consistent with the research goal of the Rocky Mountain Regional Hazardous Substance Research Center (HSRC), proposals that pertain to one or more of the following categories of activities are specifically requested:

- Development of cost-effective and rapid techniques for characterizing the extent and impacts of contamination resulting from mine-waste sites.
- Development of improved methods to predict the fate and transport of metals and other toxic chemicals emanating from mine-waste sites.
- Development of cost-effective processes and technologies for in-situ passive treatment of acid mine drainage, specifically for remote areas without power or winter access and/or high altitude.
- Development of cost-effective source control technologies for prevention of metals leaching and acid mine drainage from abandoned mine-waste piles (e.g., acidic rock dumps, waste-rock piles, tailings deposits, spoiled heap-leach pads, etc.).
- Improved capabilities for evaluating risk assessments for developing rational clean-up strategies related to impacts resulting from mine-waste sites.

### **Eligibility**

In accordance with EPA's "Programmatic Terms and Conditions for Centers and Consortia", this solicitation is restricted to the general faculties of Colorado State University and the Colorado School of Mines as the two primary consortium universities involved in research activities for the Rocky Mountain Regional HSRC. Specific individuals identified as "Other Participants" in the original proposal for the Rocky

Mountain Regional HSRC to EPA and currently listed on the web page for the Rocky Mountain Regional HSRC (see "Administration" at [www.engr.colostate.edu/hsrc/](http://www.engr.colostate.edu/hsrc/)) may be included as co-investigators through one or more faculty from either or both of the two consortium research universities. However, the principal investigator for the proposal must be a faculty member of either Colorado State University or the Colorado School of Mines.

### **Preparation Guidelines**

The proposal should include: (1) the objectives and scientific, engineering, and/or educational significance of the proposed work, (2) the suitability of the methods to be used, (3) the qualifications of the investigator to perform the proposed work, (4) the relevance of the proposed work to the research goals of the Rocky Mountain Regional HSRC and the specific research needs outlined above, and (5) the amount of funding required. The project description should clearly present the merits of the proposed project and should be prepared with the care and thoroughness of a paper submitted for publication. Sufficient information should be provided so that reviewers can evaluate the proposal in accordance with the evaluation criteria (see next section).

Proposals should be submitted using single-spaced type on 8.5 x 11-inch standard paper with 1-inch margins all around using either Times New Roman size 12 font or Arial size 11 font. The body of the text (Project Description) must be limited to a total of 8 pages exclusive of the other components of the proposal as described subsequently.

The proposal should be organized in accordance with the following outline:

- Cover Page (1 page maximum): Proposal Title, PI and Co-PI(s) information (name, title, address, phone and fax numbers, e-mail address, signatures of all investigators, and date of submission)
- Project Abstract (1 page maximum, including project title, investigator(s), institution, project period, project amount, objectives/hypothesis, approach, and expected results)
- Project Description (8 pages maximum)
- References Cited
- Budget (1 page for each year of project and a 1-page cumulative budget) including salaries and wages, fringe benefits, equipment, travel, participant support, materials and supplies, publication/documentation/dissemination, consultant services, computer services, tuition, sub-awards, total direct costs, indirect costs (amount and rate), total direct and indirect costs, residual funds, amount of request, cost sharing)
- Budget Justification (for exceptional items only)
- Biographical Sketches (2 pages maximum for each investigator)

### **Evaluation of Proposals**

The proposals will be evaluated by the Science Advisory Committee (SAC) of the Rocky Mountain Regional HSRC comprised of qualified representatives from industry, academia, and federal agencies. The SAC will evaluate and rank proposals based on merit and responsiveness to the aforementioned description. Additional consideration will be given to the following aspects:

- quality of the proposal and the proposed activity,
- ability of the personnel to perform the proposed activity within the time frame and proposed budget, and
- potential significance and impact of the proposed activity in terms of remediation of mine-waste sites.

Funded projects will be reviewed semi-annually at the discretion of the SAC to evaluate the quality and the progress of the projects. At the discretion of the SAC, projects that fail to demonstrate satisfactory progress may be terminated prior to completion without further funding obligation.

### **Funding Limits and Guidelines**

The ability of the Rocky Mountain Regional HSRC to fund new projects will depend on the availability of funds, and the SAC may choose to award only partial funding. Anticipated total funding allocations (direct + indirect costs) are approximately \$110k to \$120k for the '02-'03 funding period, and \$610k to \$620k for the '03-'04 and '04-'05 funding periods.

The preferred funding range for total budgets (direct plus indirect) is between \$10,000 and \$50,000 per year, and the preferred funding duration is for 2 years (no projects with duration greater than 3 years will be considered). In accordance with EPA guidelines, matching funds from non-federal sources are required in the amount of 25 percent of the funded amount or 20 percent of the total amount (e.g., for every \$4 of funds from the Rocky Mountain Regional HSRC, \$1 of matching funds is required for a total of \$5).

Consistent with Rocky Mountain Regional HSRC policy, requests for salary funds must be limited to undergraduate and graduate research assistants, post-doctoral research associates, and other research personnel who are not full-time faculty at their respective institutions. In accordance with federal restrictions, EPA funds cannot be allocated to other government agencies or to non-US investigators.

### **Submission of Proposals**

Submit 15 copies of the complete proposal, one with original signatures of the principal investigator and collaborators to:

Administrative Assistant  
Rocky Mountain Regional Hazardous Substance Research Center  
c/o Department of Civil Engineering  
Colorado State University  
Fort Collins, CO 80523-1372

Final signatures, including signatures of an official authorized to sign for the institution, will be required prior to the start of projects for proposals selected for funding. Deadline for receipt of proposals is 5 pm Mountain Time, Friday, June 10, 2002. Announcement of approved proposals will be on or about August 30, with an anticipated starting date of October 1, 2002, for new projects (i.e., based on the availability of funds).

### **Further Information**

- Dr. Charles D. Shackelford, Director, Rocky Mountain Regional HSRC  
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- Dr. Donald L. Macalady, Associate Director, Rocky Mountain Regional HSRC  
Phone: (303) 273-3996; E-mail: dmacalad@mines.edu
- Rocky Mountain Regional HSRC Web Page: [www.engr.colostate.edu/hsrc/](http://www.engr.colostate.edu/hsrc/)